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Docket No.: 826.1553

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Akira NAKAGAWA, et al.

Serial No. 09/348,165 Group Art Unit: 2613

Confirmation No. 4844

Filed: July 7, 1999 Examiner: Allen C. WONG

For: MOTION VECTOR ENCODING DEVICE AND DECODING DEVICE

RESUBMISSION OF APPEAL BRIEF PER DECISION ON PETITION

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

This is in response to the Decision on Petition mailed October 19, 2005.

The attached Appeal Brief, which was previously filed on October 12, 2005, before the receipt of the Decision on Petition is hereby being resubmitted to satisfy the requirements specified in the Decision.

S&H Form: (2/01)

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APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 41.37

Mail Stop - Appeal Brief - Patents

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

The following comprises the Appellants' Brief on Appeal from the final rejection, dated November 18, 2004, of claims 11-23. This Appeal Brief is accompanied by the required appeal fee set forth in 37 C.F.R. § 41.20(b)(2), as well as a petition for a one-month extension of time to October 12, 2005. Appellants' Notice of Appeal was filed on July 12, 2005. Therefore, the present Appeal Brief is timely filed.

I. REAL PARTY IN INTEREST

The above-captioned application is assigned in its entirety to Fujitsu Limited, having a corporate situs of Japan.

II. RELATED APPEALS AND INTERFERENCES

Appellants state that, upon information and belief, Appellants are not aware of any co-pending appeal or interference, which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 5 and 11-23 are pending in the application. Claim 5 is allowed. Claims 1-4 and 6-10 have been cancelled. Claims 11-23 stand rejected. The rejection of claims 11-23 is being appealed.

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A. Independent Claim 11

Independent claim 11 is directed to a motion vector decoding device 70 for decoding an encoding result, an embodiment of which is shown in Fig. 15. The encoding result may be obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, as described at page 15, lines 20-23 of the specification and shown in Fig. 7.

The motion vector decoding device 70, an embodiment of which is shown in Fig. 15 and described at page 36, lines 5-25, and page 37, lines 1-15 of the specification, may include predicting means for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block. An embodiment of means for predicting a motion vector is shown as element 37 in Fig. 7 and described at page 16, lines 13-25, and page 17, line 1 of the specification.

The motion vector decoding device may further include determining means for determining accuracy of a prediction made by said predicting means based on degrees of non-

uniformity of the plurality of motion vectors. An embodiment of means for determining accuracy of a prediction is shown as determining unit 51 in Fig. 8 and described at page 18, lines 24 and 25, and page 19, lines 1-14, and also shown as determining unit 61 in Figs. 12 and 15 and described at page 28, lines 10-18, page 36, lines 7-12, and page 37, lines 16-25 of the specification.

Finally, the motion vector decoding device may include decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means. An embodiment of means for decoding the motion vector is shown as decoding units 71a, 71b, 73a, and 73b in Fig. 15 and described at page 36, lines 12-20, and page 38, lines 1-10 of the specification.

B. Independent Claim 12

Independent claim 12 is directed to a motion vector decoding device 70 for decoding an output of a motion vector encoding device which predicts a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block within the frame, determines accuracy of a prediction based on degrees of non-uniformity of a plurality of motion vectors which have already been encoded in an area adjacent to the target block, and encodes the motion vector of the target block by using a result of the prediction with an encoding method determined based on a result of a determination of the accuracy of the prediction, in order to encode motion vectors of respective blocks obtained by partitioning each frame of moving image data, an embodiment of which is shown in Fig. 15. The encoding result may be obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, as described at page 15, lines 20-23 of the specification and shown in Fig. 7.

The motion vector decoding device 70, an embodiment of which is shown in Fig. 15 and described at page 36, lines 5-25, and page 37, lines 1-15 of the specification, may include predicting means for predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block used to make the determination within the motion vector encoding device. An embodiment of means for predicting a motion vector is shown as element 37 in Fig. 7 and described at page 16, lines 13-25, and page 17, line 1 of the specification.

The motion vector decoding device may further include determining means for determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold. An embodiment of means for determining accuracy of a prediction is shown as determining unit 51 in Fig. 8 and described at page 18, lines 24 and 25, and page 19, lines 1-14, and also shown as determining unit 61 in Figs. 12 and 15 and described at page 28, lines 10-18, page 36, lines 7-12, and page 37, lines 16-25 of the specification.

Finally, the motion vector decoding device may include decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means. An embodiment of the means for decoding the motion vector is shown as decoding units 71a, 71b, 73a, and 73b in Fig. 15 and described at page 36, lines 12-20, and page 38, lines 1-10 of the specification.

C. <u>Independent Claim 13</u>

Independent claim 13 is directed to a method of motion vector decoding for decoding a result of encoding obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, an embodiment of which is shown in Fig. 15.

The method of motion vector decoding, an embodiment of which is shown in Fig. 15 and described at page 36, lines 5-25, and page 37, lines 1-15 of the specification, may include predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block. An embodiment of predicting a motion vector is shown as element 37 in Fig. 7 and described at page 16, lines 13-25, and page 17, line 1 of the specification.

The motion vector decoding device may further include determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors. An embodiment of determining the accuracy of a prediction is shown as determining unit 51 in Fig. 8 and described at page 18, lines 24 and 25, and page 19, lines 1-14, and also shown as determining unit 61 in Figs. 12 and 15 and described at page 28, lines 10-18, page 36, lines 7-12, and page 37, lines 16-25 of the specification.

Finally, the motion vector decoding device may include decoding the motion vector of the target block by using a result of the prediction with a decoding method determined based on a result of a determination of the accuracy of the prediction. An embodiment decoding the motion

vector is shown as decoding units 71a, 71b, 73a, and 73b in Fig. 15 and described at page 36, lines 12-20, and page 38, lines 1-10 of the specification.

D. Independent Claim 20

Independent claim 20 is directed to motion vector decoding device 70 for motion vector decoding device for decoding an output of a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, determines accuracy of a prediction based on a plurality of motion vectors which have already been encoded in an area adjacent to the target block, and encodes the motion vector of the target block by using a result of the prediction with an encoding method determined based on a result of a determination of the accuracy of the prediction, in order to encode motion vectors of respective blocks obtained by partitioning each frame of moving image data, an embodiment of which is shown in Fig. 15. The encoding result may be obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, as described at page 15, lines 20-23 of the specification, and shown in Fig. 7.

The motion vector decoding device 70, an embodiment of which is shown in Fig. 15 and described at page 36, lines 5-25, and page 37, lines 1-15 of the specification, may include predicting means for predicting the motion vector of the target block based on the plurality of motion vectors used to make the determination within the motion vector encoding device. An embodiment of means for predicting a motion vector is shown as element 37 in Fig. 7 and described at page 16, lines 13-25, and page 17, line 1 of the specification.

The motion vector decoding device may further include determining means for determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors. An embodiment of means for determining accuracy of a prediction is shown as determining unit 51 in Fig. 8 and described at page 18, lines 24 and 25, and page 19, lines 1-14, and also shown as determining unit 61 in Figs. 12 and 15 and described at page 28, lines 10-18, page 36, lines 7-12, and page 37, lines 16-25 of the specification.

Finally, the motion vector decoding device may include decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means. An embodiment of the means for decoding the motion vector is shown as

decoding units 71a, 71b, 73a, and 73b in Fig. 15 and described at page 36, lines 12-20, and page 38, lines 1-10 of the specification.

E. Independent Claim 21

Independent claim 21 is directed to a motion vector decoding device 70 for decoding an encoding result, which is obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, an embodiment of which is shown in Fig. 15. The encoding result may be obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, as described at page 15, lines 20-23 of the specification, and shown in Fig. 7.

The motion vector decoding device 70, an embodiment of which is shown in Fig. 15 and described at page 36, lines 5-25, and page 37, lines 1-15 of the specification, may include predicting means for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block. An embodiment of means for predicting a motion vector is shown as element 37 in Fig. 7 and described at page 16, lines 13-25, and page 17, line 1 of the specification.

The motion vector decoding device may further include determining means for determining accuracy of a prediction made by said predicting means based on the plurality of motion vectors. An embodiment of means for determining accuracy of a prediction is shown as determining unit 51 in Fig. 8 and described at page 18, lines 24 and 25, and page 19, lines 1-14, and also shown as determining unit 61 in Figs. 12 and 15 and described at page 28, lines 10-18, page 36, lines 7-12, and page 37, lines 16-25 of the specification.

Finally, the motion vector decoding device may include decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means. An embodiment of means for decoding the motion vector is shown as decoding units 71a, 71b, 73a, and 73b in Fig. 15 and described at page 36, lines 12-20, and page 38, lines 1-10 of the specification.

F. Independent Claim 22

Independent claim 22 is directed to a motion vector decoding method for decoding a result of encoding obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, an embodiment of which is shown in Fig. 15. The

encoding result may be obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, as described at page 15, lines 20-23 of the specification, and shown in Fig. 7.

The method of motion vector decoding 70, an embodiment of which is shown in Fig. 15 and described at page 36, lines 5-25, and page 37, lines 1-15 of the specification, may include predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block within the frame. An embodiment of predicting a motion vector is shown as element 37 in Fig. 7 and described at page 16, lines 13-25, and page 17, line 1 of the specification.

The motion vector decoding device may further include determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold. An embodiment of determining the accuracy of a prediction is shown as determining unit 51 in Fig. 8 and described at page 18, lines 24 and 25, and page 19, lines 1-14, and also shown as determining unit 61 in Figs. 12 and 15 and described at page 28, lines 10-18, page 36, lines 7-12, and page 37, lines 16-25 of the specification.

Finally, the motion vector decoding device may include decoding the motion vector of the target block by using a result of the prediction with a decoding method determined based on a result of a determination of the accuracy of the prediction. An embodiment of the means for decoding the motion vector is shown as decoding units 71a, 71b, 73a, and 73b in Fig. 15 and described at page 36, lines 12-20, and page 38, lines 1-10.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejection are to be reviewed in this Appeal:

The rejection of claims 11-23 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,198,901 to Lynch (hereinafter "Lynch") in view of U.S. Pat. No. 5,428,396 to Yagasaki et al. (hereinafter "Yagasaki ").

VII. ARGUMENTS

A. Independent Claim 11

First, independent claim 11, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all

of the features of independent claim 11. Neither Lynch nor Yagasaki, for example, disclose "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11.

The Examiner asserts at page 2, lines 12-16 of the final Office Action:

"Lynch discloses the predicting meant for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, as disclosed in fig.17 and col. 10, ln. 23, to col. 11, ln. 4, where the "PREDICTION" or the prediction of the motion vector is predicatively done."

This is submitted to be incorrect. Lynch, rather, extrapolates motion vectors for a particular B Block from that B block only, as described at column 10, lines 42, 43, and 44,

> "a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

The passage in Lynch cited in the final Office Action, to the contrary, mentions nothing about "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11.

Fig. 17, for its part, shows a decoder for the AO method, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11. Lynch, in fact, describes deriving motion vectors for B frames from motion vectors for *an* anchor frame that is referenced to *a* previous anchor frame, in the description pertaining to Fig. 17 at column 11, lines 13-16,

> "motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame."

Thus, Lynch derives a motion vector for a B frame from a single anchor frame that is referenced to a previous anchor frame. This is to be contrasted with independent claim 11, which recites "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner asserts further at page 2, lines 16-19 of the final Office Action:

"that fig. 14 shows that the target block motion vector was predicted for accurately predicting the image data, especially in the MPEG interframe encoding/decoding environment when obtaining the motion vector between a current frame and a reference frame."

This is submitted to be incorrect. Lynch describes Fig. 14, rather, at column 10, lines 31-46 as showing interpolation of B frames *from* a predicted frame such as P_3, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11. In particular, as described in Lynch at column 10, lines 31-46,

> "FIG. 14 is a block diagram for an encoder incorporating this invention. Those components corresponding to components in FIG. 11 are designated in the same way. Forward motion vectors for P_3, such as mv_{30}, are stored in a memory 89 for a period (delay) of one or two frames as required by frames B_1 and B_2 respectively (see FIG. 3). The stored motion vectors are supplied by the Fmv Memory 89 to an Area Overlap Motion Vector Calculator 90 where forward and backward motion vectors AO FMv and AO BMv are calculated for B frame motion blocks in a manner described by reference to FIGS. 4 through 10. As previously explained, a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

Thus, in Lynch, whatever prediction went into P_3 happened before Fig. 14, and involved no "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11.

Finally, the Examiner asserts at page 2, lines 19-21 of the final Office Action that,

"Also, Lynch's fig. 5 discloses that a frame with the shaded area of interest has, for instance, four blocks that are obtained, utilized for predicting a motion vector."

This is submitted to be incorrect. Fig. 5, rather, depicts using the degree of overlap of a projected motion vector to estimate the accuracy of the projection. In particular, as described at column 4, lines 60-68, continuing at column 5, lines 14 of Lynch,

> "By way of example, suppose we wish to find the area of overlap of the projection of the motion block in the upper left corner of the P_3 frame of FIG. 4 with the motion block at j=1, i=2 of the B_1 frame. As shown in FIG. 5, L1=16 pixels and L2=8 pixels. By observation, the width of the overlap is 12 pixels and its height is 6, so that the desired area is 12 X 6=72 pixels. If the defined relationship is that the reference point is the top left corner of a block, then u=12 and v=18 and x=16 and y=16 so that the area of overlap in accordance with the formula is:
> AO = [16-|16-12|][8-|16-18|] = [16-4][8-2] = 12 X 6 = 72
> As illustrated by the flow charts of FIGS. 6 through 10 for calculating the areas of overlap AO, the areas of overlap in each of the blocks of a B frame are derived for each motion block in a P frame and the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap."

Thus, in Lynch, the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap. Therefore, the magnitude of the overlap is assessed *after* the projection. Any prediction to be performed in Fig. 5 has already occurred, and now the accuracy of a projection of is being assessed. None of the four blocks will be used to predict anything, let alone motion. This is to be contrasted with independent claim 11, which recites, "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner, in fact, acknowledges at page 2, line 23, continuing at page 3, line1 of the final Office Action that Lynch,

"does not disclose the prediction of a motion vector values of blocks adjacent to the target block of the same frame."

The Examiner seeks to compensate for this deficiency of Lynch by combining Lynch with Yagasaki. Yagasaki, however, neither teaches, discloses, nor suggests "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block" either, and thus cannot compensate for the deficiencies of Lynch with respect to independent claim 11.

The Examiner asserts at page 3, lines 1-3 of the final Office Action that,

"Yagasaki teaches the motion vectors of adjacent blocks to the target block in the same frame are implemented for obtaining a predicted motion vector, as disclosed at col. 18, ln. 1-13."

This is submitted to be incorrect. Yagasaki is talking about differential encoding for transmitting motion vectors at column 18, lines 1-13, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11. Whatever predictions are to be done in Yagasaki have already been done. All Yagasaki is doing now is encoding the results. In particular, as described at column 18, lines 6-12 of Yagasaki,

> "An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0."

Thus, the motion vector values have already been produced. The adjacent blocks to which Yagasaki refers are adjacent blocks of data to be transmitted, not "a plurality of blocks adjacent to the target block," as recited in independent claim 11. Yagasaki, rather, is preserving

bandwidth by transmitting only the changes to the motion vectors relative to those around them, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11.

In particular, the only prediction discussed in Yagasaki relates to interframe predictive coding with motion compensation, such as at column 1, lines 31-42, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 11,

> "Inter-frame predictive coding using correlation between frames is one known technique for highly efficient coding of a moving picture signal. In particular, inter-frame predictive coding with motion compensation is known, as in the MPEG document referred to above.
>
> "Motion compensated predictive coding uses correlation over time within the picture signal. A difference signal is formed for a present frame with respect to a past frame, after compensating for motion in the picture between the two frames."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 11, independent claim 11 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 11 be withdrawn.

Second, independent claim 11, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because the Examiner has not made out a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner.

The test for obviousness under 35 U.S.C. § 103 (a) is set forth by the United States Supreme Court in Graham v. John Deere, Co., 383 U.S. 1, 17-18 (1966). As mandated therein, in an obviousness determination under 35 U.S.C. § 103, the scope and content of the prior art are to be determined, the differences between the prior art and the claims at issue are to be ascertained and the level of ordinary skill in the pertinent art resolved. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577 (Fed. Cir. 1984). A suggestion, teaching or motivation to combine the prior art references is an "essential evidentiary component of an obviousness holding." C.R.

Bard, Inc. v. MP3 Sys., Inc., 157 F.3d 1340, 1352 (Fed. Cir. 1998). "When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references." In re Rouffet, 47 USPQ2d 1453, 1456 (Fed. Cir. 1998). Furthermore, the suggestion must be clear and particular; broad conclusory statements about the teaching of multiple references, standing alone, are not "evidence." Brown & Williamson Tobacco Corp. v. Philip Morris Inc., 229 F.3d 1120 (Fed. Cir. 2000).

Here, the Examiner has pointed to no evidence, either in the references or the general knowledge of the prior art, of a suggestion or motivation to combine the references in the proposed manner. The broad conclusory statement by the Examiner at page 7, lines 4-8 of the final Office Action that,

"it would have been obvious to one of ordinary skill to combine the teachings of Lynch and Yagasaki as a whole for accurately predicting motion vectors so as to efficiently produce clear, precise images for viewing and saving costs,"

in particular, is not "evidence" of a suggestion or motivation to combine the references as required for a finding of obviousness.

Lynch, rather, is complete in itself. There would thus have been no reason for persons of ordinary skill in the art at the time the invention was made to look to Yagasaki to make up for any deficiency of Lynch. Simply put, there would have been no need to look to Yagasaki to produce clear, precise images for viewing and saving costs any more efficiently than Lynch already had.

Furthermore, Lynch teaches away from the combination proposed by the Examiner at column 2, lines 39-54, when he describes differential pulse code modulation systems, for example, as requiring the transmission of a significant amount of residue in most cases,

> "In article 4, which is incorporated herein by reference, a differential pulse code modulation system is described that is like the IS system described above except for the fact that the motion vectors for the B frames are derived from motion vectors such as mv_{30} or mv_{63} of FIG. 2 that indicate the relative position of a block in an anchor frame that matches a block in the next anchor frame. The motion vector selected for a motion block in a B frame is the motion vector for a block in the later anchor frame that is in the same spatial position. If linear motion is assumed, a motion vector mv_{20} (i, j) would equal $2/3mv_{30}$ (i, j) and mv_{23} (i, j) would equal $-1/3mv_{30}$ (i, j). While this method has the advantage of not transmitting motion vectors for the B frames, the motion vectors that are used require the transmission of a significant amount of residue in most cases."

Transmitting residues, on the other hand, is exactly what Yagasaki is doing, as described in the Abstract,

"In connection with compression-coding of video signals on the basis of inter-frame correlation, a single reference table is used for variable length encoding of inter-frame motion vectors established on the basis of various motion vector value ranges and degrees of accuracy. A reference table is provided for variable length encoding motion vectors based on a particular value range and degree of accuracy. In order to use the same table for motion vectors based on a larger value range than that for which the table was designed, the value of a motion vector to be encoded is divided to form a quotient and a remainder. An addition bit code is formed on the basis of the remainder and is appended to a variable length code which corresponds in the reference table to the quotient so that a variable length code value is formed for the motion vector based on the larger range."

Thus, Yagasaki is going to transmit the residues, he just seeks to code the residues efficiently, using variable length codes in which longer code words represent lower accuracy, i.e. larger residues. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would have been deterred, rather than encouraged, from the modification proposed in the final Office Action, since Lynch teaches away from encoding residues at all. Consequently, the Examiner has failed to set forth a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Appellants, therefore, respectfully request that the rejection of independent claim 11 be withdrawn.

Third, independent claim 11, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 11. Neither Lynch nor Yagasaki, for example, disclose "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 11.

The Examiner asserts at page 3, lines 18-23, continuing at page 4, lines 1 and 2,

"As previously stated, col. 11, ln. 18-22 and fig.17, note "MODE" is determined and motion vector calculator 111 determines the prediction accuracy based on non-uniformity of the plural motion vectors."

This is submitted to be incorrect. As shown in Fig. 17, only one lead, and hence one input, enters AO Mv Calculator 111. Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 11.

Furthermore, the Area Overlap (AO) method depicted in Fig. 17 is described in Lynch at column 11, lines 5-22 as deriving motion vectors for B frames from motion vectors for an anchor frame that is referenced to a previous anchor frame, in the singular. Each motion vector is

derived from a single anchor frame, not "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 11. The motion vectors themselves are input singly to AO Mv Calculator 111, as is apparent from the single input lead. In particular, as described in Lynch at column 11, lines 5-22,

> "A decoder for the AO method is shown in FIG. 17 in which components corresponding to those of FIG. 13 are designated in the same way. In view of the fact that motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame, blocks 110 and 111 are used by the decoder for this purpose. These are identical to blocks 89 and 90 in FIG. 14. The mode information instructs the displacement blocks 104 and 105 as well as switch 107 as to the prediction mode to be used for B frame motion blocks. Otherwise, the operation of this decoder is identical to that of the decoder for the IS method."

Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 11.

Yagasaki, for its part, describes no motion vectors at all, let alone "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 11. Yagasaki, rather, is discussing encoding motion vectors at column 18, lines 1-13, not "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 11, contrary to the assertion in the final Office Action at page 3, lines 1-3. In particular, as described in Yagasaki at column 18, lines 1-13,

> "Finally, there will be described an embodiment of the present invention in which motion vector values are encoded with differential PCM (DPCM), so that the data transmitted with respect to motion vector values represents only the differences between motion vector values for adjacent blocks. An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0. The difference values are then variable length encoded in a motion vector VLC."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of

independent claim 11, independent claim 11 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 11 be withdrawn.

B. Independent Claim 12

First, independent claim 12, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 12. Neither Lynch nor Yagasaki, for example, disclose "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12.

The Examiner asserts at page 2, lines 12-16 of the final Office Action:

"Lynch discloses the predicting meant for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, as disclosed in fig.17 and col. 10, ln. 23, to col. 11, ln. 4, where the "PREDICTION" or the prediction of the motion vector is predicatively done."

This is submitted to be incorrect. Lynch, rather, extrapolates motion vectors for a particular B Block from that B block only, as described at column 10, lines 42, 43, and 44,

> "a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

The passage in Lynch cited in the final Office Action, to the contrary, mentions nothing about "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12.

Fig. 17, for its part, shows a decoder for the AO method, not "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12. Lynch, in fact, describes deriving motion vectors for B frames from motion vectors for *an* anchor frame that is referenced to *a* previous anchor frame, in the description pertaining to Fig. 17 at column 11, lines 13-16,

"motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame."

Thus, Lynch derives a motion vector for a B frame from a single anchor frame that is referenced to a previous anchor frame. This is to be contrasted with independent claim 12, which recites "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block."

The Examiner asserts further at page 2, lines 16-19 of the final Office Action:

"that fig. 14 shows that the target block motion vector was predicted for accurately predicting the image data, especially in the MPEG interframe encoding/decoding environment when obtaining the motion vector between a current frame and a reference frame."

This is submitted to be incorrect. Lynch describes Fig. 14, rather, at column 10, lines 31-46 as showing interpolation of B frames *from* a predicted frame such as P_3, not "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12. In particular, as described in Lynch at column 10, lines 31-46,

"FIG. 14 is a block diagram for an encoder incorporating this invention. Those components corresponding to components in FIG. 11 are designated in the same way. Forward motion vectors for P_3, such as mv_{30}, are stored in a memory 89 for a period (delay) of one or two frames as required by frames B_1 and B_2 respectively (see FIG. 3). The stored motion vectors are supplied by the Fmv Memory 89 to an Area Overlap Motion Vector Calculator 90 where forward and backward motion vectors AO FMv and AO BMv are calculated for B frame motion blocks in a manner described by reference to FIGS. 4 through 10. As previously explained, a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

Thus, in Lynch, whatever prediction went into P_3 happened before Fig. 14, and involved no "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12.

Finally, the Examiner asserts at page 2, lines 19-21 of the final Office Action that,

"Also, Lynch's fig. 5 discloses that a frame with the shaded area of interest has, for instance, four blocks that are obtained, utilized for predicting a motion vector."

This is submitted to be incorrect. Fig. 5, rather, depicts using the degree of overlap of a projected motion vector to estimate the accuracy of the projection. In particular, as described at column 4, lines 60-68, continuing at column 5, lines 14 of Lynch,

> "By way of example, suppose we wish to find the area of overlap of the projection of the motion block in the upper left corner of the P_3 frame of FIG. 4 with the motion block at j=1, i=2 of the B_1 frame. As shown in FIG. 5, L1=16 pixels and L2=8 pixels. By observation, the width of the overlap is 12 pixels and its height is 6, so that the desired area is 12 X 6=72 pixels. If the defined relationship is that the reference point is the top left corner of a block, then u=12 and v=18 and x=16 and y=16 so that the area of overlap in accordance with the formula is:
> AO = [16-|16-12|][8-|16-18|] = [16-4][8-2] = 12 X 6 = 72
> As illustrated by the flow charts of FIGS. 6 through 10 for calculating the areas of overlap AO, the areas of overlap in each of the blocks of a B frame are derived for each motion block in a P frame and the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap."

Thus, in Lynch, the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap. Therefore, the magnitude of the overlap is assessed *after* the projection. Any prediction to be performed in Fig. 5 has already occurred, and now the accuracy of a projection of is being assessed. None of the four blocks will be used to predict anything, let alone motion. This is to be contrasted with independent claim 12, which recites, "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block."

The Examiner, in fact, acknowledges at page 2, line 23, continuing at page 3, line1 of the final Office Action that Lynch,

> "does not disclose the prediction of a motion vector values of blocks adjacent to the target block of the same frame."

The Examiner seeks to compensate for this deficiency of Lynch by combining Lynch with Yagasaki. Yagasaki, however, neither teaches, discloses, nor suggests "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block" either, and thus cannot compensate for the deficiencies of Lynch with respect to independent claim 12.

The Examiner asserts at page 3, lines 1-3 of the final Office Action that,

"Yagasaki teaches the motion vectors of adjacent blocks to the target block in the same frame are implemented for obtaining a predicted motion vector, as disclosed at col. 18, ln. 1-13."

This is submitted to be incorrect. Yagasaki is talking about differential encoding for transmitting motion vectors at column 18, lines 1-13, not "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12. Whatever predictions are to be done in Yagasaki have already been done. All Yagasaki is doing now is encoding the results. In particular, as described at column 18, lines 6-12 of Yagasaki,

> "An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0."

Thus, the motion vector values have already been produced. The adjacent blocks to which Yagasaki refers are adjacent blocks of data to be transmitted, not "a plurality of blocks adjacent to the target block," as recited in independent claim 12. Yagasaki, rather, is preserving bandwidth by transmitting only the changes to the motion vectors relative to those around them, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 12.

In particular, the only prediction discussed in Yagasaki relates to interframe predictive coding with motion compensation, such as at column 1, lines 31-42, not "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," as recited in independent claim 12,

> "Inter-frame predictive coding using correlation between frames is one known technique for highly efficient coding of a moving picture signal. In particular, inter-frame predictive coding with motion compensation is known, as in the MPEG document referred to above.
>
> "Motion compensated predictive coding uses correlation over time within the picture signal. A difference signal is formed for a present frame with respect to a past frame, after compensating for motion in the picture between the two frames."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination,

disclose all of the features of independent claim 12, independent claim 12 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 12 be withdrawn.

Second, independent claim 12, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because the Examiner has not made out a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Here, the Examiner has pointed to no evidence, either in the references or the general knowledge of the prior art, of a suggestion or motivation to combine the references in the proposed manner. The broad conclusory statement by the Examiner at page 7, lines 4-8 of the final Office Action that,

"it would have been obvious to one of ordinary skill to combine the teachings of Lynch and Yagasaki as a whole for accurately predicting motion vectors so as to efficiently produce clear, precise images for viewing and saving costs,"

in particular, is not "evidence" of a suggestion or motivation to combine the references as required for a finding of obviousness.

Lynch, rather, is complete in itself. There would thus have been no reason for persons of ordinary skill in the art at the time the invention was made to look to Yagasaki to make up for any deficiency of Lynch. Simply put, there would have been no need to look to Yagasaki to produce clear, precise images for viewing and saving costs any more efficiently than Lynch already had.

Furthermore, Lynch teaches away from the combination proposed by the Examiner at column 2, lines 39-54, when he describes differential pulse code modulation systems, for example, as requiring the transmission of a significant amount of residue in most cases,

> "In article 4, which is incorporated herein by reference, a differential pulse code modulation system is described that is like the IS system described above except for the fact that the motion vectors for the B frames are derived from motion vectors such as mv_{30} or mv_{63} of FIG. 2 that indicate the relative position of a block in an anchor frame that matches a block in the next anchor frame. The motion vector selected for a motion block in a B frame is the motion vector for a block in the later anchor frame that is in the same spatial position. If linear motion is assumed, a motion vector mv_{20} (i, j) would equal $2/3mv_{30}$ (i, j) and mv_{23} (i, j) would equal $-1/3mv_{30}$ (i, j). While this method has the advantage of not transmitting motion vectors for the B frames, the motion vectors that are used require the transmission of a significant amount of residue in most cases. "

Transmitting residues, on the other hand, is exactly what Yagasaki is doing, as described in the Abstract,

> "In connection with compression-coding of video signals on the basis of inter-frame correlation, a single reference table is used for variable length encoding of inter-frame motion vectors established on the basis of various motion vector value ranges and degrees of accuracy. A reference table is provided for variable length encoding motion vectors based on a particular value range and degree of accuracy. In order to use the same table for motion vectors based on a larger value range than that for which the table was designed, the value of a motion vector to be encoded is divided to form a quotient and a remainder. An addition bit code is formed on the basis of the remainder and is appended to a variable length code which corresponds in the reference table to the quotient so that a variable length code value is formed for the motion vector based on the larger range."

Thus, Yagasaki is going to transmit the residues, he just seeks to code the residues efficiently, using variable length codes in which longer code words represent lower accuracy, i.e. larger residues. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would have been deterred, rather than encouraged, from the modification proposed in the final Office Action, since Lynch teaches away from encoding residues at all. Consequently, the Examiner has failed to set forth a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Appellants, therefore, respectfully request that the rejection of independent claim 12 be withdrawn.

Third, independent claim 12, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 12. Neither Lynch nor Yagasaki, for example, disclose "determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 12.

The Examiner asserts at page 3, lines 18-23, continuing at page 4, lines 1 and 2,

"As previously stated, col. 11, ln. 18-22 and fig.17, note "MODE" is determined and motion vector calculator 111 determines the prediction accuracy based on non-uniformity of the plural motion vectors."

This is submitted to be incorrect. As shown in Fig. 17, only one lead, and hence one input, enters AO Mv Calculator 111. Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 12.

Furthermore, the Area Overlap (AO) method depicted in Fig. 17 is described in Lynch at column 11, lines 5-22 as deriving motion vectors for B frames from motion vectors for an anchor

frame that is referenced to a previous anchor frame, in the singular. Each motion vector is derived from a single anchor frame, not "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 12. The motion vectors themselves are input singly to AO Mv Calculator 111, as is apparent from the single input lead. In particular, as described in Lynch at column 11, lines 5-22,

> "A decoder for the AO method is shown in FIG. 17 in which components corresponding to those of FIG. 13 are designated in the same way. In view of the fact that motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame, blocks 110 and 111 are used by the decoder for this purpose. These are identical to blocks 89 and 90 in FIG. 14. The mode information instructs the displacement blocks 104 and 105 as well as switch 107 as to the prediction mode to be used for B frame motion blocks. Otherwise, the operation of this decoder is identical to that of the decoder for the IS method."

Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 12.

Yagasaki, for its part, describes no motion vectors at all, let alone "determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 12. Yagasaki, rather, is discussing encoding motion vectors at column 18, lines 1-13, not "determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 12, contrary to the assertion in the final Office Action at page 3, lines 1-3. In particular, as described in Yagasaki at column 18, lines 1-13,

> "Finally, there will be described an embodiment of the present invention in which motion vector values are encoded with differential PCM (DPCM), so that the data transmitted with respect to motion vector values represents only the differences between motion vector values for adjacent blocks. An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0. The difference values are then variable length encoded in a motion vector VLC."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly,

because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 12, independent claim 12 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 12 be withdrawn.

C. Independent Claim 13

First, independent claim 13, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 13. Neither Lynch nor Yagasaki, for example, disclose "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13.

The Examiner asserts at page 2, lines 12-16 of the final Office Action:

"Lynch discloses the predicting meant for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, as disclosed in fig.17 and col. 10, ln. 23, to col. 11, ln. 4, where the "PREDICTION" or the prediction of the motion vector is predicatively done."

This is submitted to be incorrect. Lynch, rather, extrapolates motion vectors for a particular B Block from that B block only, as described at column 10, lines 42, 43, and 44,

> "a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

The passage in Lynch cited in the final Office Action, to the contrary, mentions nothing about "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13.

Fig. 17, for its part, shows a decoder for the AO method, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13. Lynch, in fact, describes deriving motion vectors for B frames from motion vectors for *an* anchor frame that is referenced to *a* previous anchor frame, in the description pertaining to Fig. 17 at column 11, lines 13-16,

> "motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame."

Thus, Lynch derives a motion vector for a B frame from a single anchor frame that is referenced to a previous anchor frame. This is to be contrasted with independent claim 13, which recites "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner asserts further at page 2, lines 16-19 of the final Office Action:

"that fig. 14 shows that the target block motion vector was predicted for accurately predicting the image data, especially in the MPEG interframe encoding/decoding environment when obtaining the motion vector between a current frame and a reference frame."

This is submitted to be incorrect. Lynch describes Fig. 14, rather, at column 10, lines 31-46 as showing interpolation of B frames *from* a predicted frame such as P_3, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13. In particular, as described in Lynch at column 10, lines 31-46,

> "FIG. 14 is a block diagram for an encoder incorporating this invention. Those components corresponding to components in FIG. 11 are designated in the same way. Forward motion vectors for P_3, such as mv_{30}, are stored in a memory 89 for a period (delay) of one or two frames as required by frames B_1 and B_2 respectively (see FIG. 3). The stored motion vectors are supplied by the Fmv Memory 89 to an Area Overlap Motion Vector Calculator 90 where forward and backward motion vectors AO FMv and AO BMv are calculated for B frame motion blocks in a manner described by reference to FIGS. 4 through 10. As previously explained, a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

Thus, in Lynch, whatever prediction went into P_3 happened before Fig. 14, and involved no "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13.

Finally, the Examiner asserts at page 2, lines 19-21 of the final Office Action that,

"Also, Lynch's fig. 5 discloses that a frame with the shaded area of interest has, for instance, four blocks that are obtained, utilized for predicting a motion vector."

This is submitted to be incorrect. Fig. 5, rather, depicts using the degree of overlap of a projected motion vector to estimate the accuracy of the projection. In particular, as described at column 4, lines 60-68, continuing at column 5, lines 14 of Lynch,

> "By way of example, suppose we wish to find the area of overlap of the projection of the motion block in the upper left corner of the P_3 frame of FIG. 4 with the

motion block at j=1, i=2 of the B_1 frame. As shown in FIG. 5, L1=16 pixels and L2=8 pixels. By observation, the width of the overlap is 12 pixels and its height is 6, so that the desired area is 12 X 6=72 pixels. If the defined relationship is that the reference point is the top left corner of a block, then u=12 and v=18 and x=16 and y=16 so that the area of overlap in accordance with the formula is:
AO = [16-|16-12|][8-|16-18|] = [16-4][8-2] = 12 X 6 = 72
As illustrated by the flow charts of FIGS. 6 through 10 for calculating the areas of overlap AO, the areas of overlap in each of the blocks of a B frame are derived for each motion block in a P frame and the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap."

Thus, in Lynch, the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap. Therefore, the magnitude of the overlap is assessed *after* the projection. Any prediction to be performed in Fig. 5 has already occurred, and now the accuracy of a projection of is being assessed. None of the four blocks will be used to predict anything, let alone motion. This is to be contrasted with independent claim 13, which recites, "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner, in fact, acknowledges at page 2, line 23, continuing at page 3, line1 of the final Office Action that Lynch,

"does not disclose the prediction of a motion vector values of blocks adjacent to the target block of the same frame."

The Examiner seeks to compensate for this deficiency of Lynch by combining Lynch with Yagasaki. Yagasaki, however, neither teaches, discloses, nor suggests "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block" either, and thus cannot compensate for the deficiencies of Lynch with respect to independent claim 13.

The Examiner asserts at page 3, lines 1-3 of the final Office Action that,

"Yagasaki teaches the motion vectors of adjacent blocks to the target block in the same frame are implemented for obtaining a predicted motion vector, as disclosed at col. 18, ln. 1-13."

This is submitted to be incorrect. Yagasaki is talking about differential encoding for transmitting motion vectors at column 18, lines 1-13, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13. Whatever predictions are to be done in Yagasaki have already been

done. All Yagasaki is doing now is encoding the results. In particular, as described at column 18, lines 6-12 of Yagasaki,

> "An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0."

Thus, the motion vector values have already been produced. The adjacent blocks to which Yagasaki refers are adjacent blocks of data to be transmitted, not "a plurality of blocks adjacent to the target block," as recited in independent claim 13. Yagasaki, rather, is preserving bandwidth by transmitting only the changes to the motion vectors relative to those around them, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 13.

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> "Motion compensated predictive coding uses correlation over time within the picture signal. A difference signal is formed for a present frame with respect to a past frame, after compensating for motion in the picture between the two frames."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 13, independent claim 13 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 13 be withdrawn.

Second, independent claim 13, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because the Examiner has not made out a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Here, the Examiner has pointed to no evidence, either in the references or the

general knowledge of the prior art, of a suggestion or motivation to combine the references in the proposed manner. The broad conclusory statement by the Examiner at page 7, lines 4-8 of the final Office Action that,

"it would have been obvious to one of ordinary skill to combine the teachings of Lynch and Yagasaki as a whole for accurately predicting motion vectors so as to efficiently produce clear, precise images for viewing and saving costs,"

in particular, is not "evidence" of a suggestion or motivation to combine the references as required for a finding of obviousness.

Lynch, rather, is complete in itself. There would thus have been no reason for persons of ordinary skill in the art at the time the invention was made to look to Yagasaki to make up for any deficiency of Lynch. Simply put, there would have been no need to look to Yagasaki to produce clear, precise images for viewing and saving costs any more efficiently than Lynch already had.

Furthermore, Lynch teaches away from the combination proposed by the Examiner at column 2, lines 39-54, when he describes differential pulse code modulation systems, for example, as requiring the transmission of a significant amount of residue in most cases,

> "In article 4, which is incorporated herein by reference, a differential pulse code modulation system is described that is like the IS system described above except for the fact that the motion vectors for the B frames are derived from motion vectors such as mv_{30} or mv_{63} of FIG. 2 that indicate the relative position of a block in an anchor frame that matches a block in the next anchor frame. The motion vector selected for a motion block in a B frame is the motion vector for a block in the later anchor frame that is in the same spatial position. If linear motion is assumed, a motion vector mv_{20} (i, j) would equal $2/3mv_{30}$ (i, j) and mv_{23} (i, j) would equal $-1/3mv_{30}$ (i, j). While this method has the advantage of not transmitting motion vectors for the B frames, the motion vectors that are used require the transmission of a significant amount of residue in most cases. "

Transmitting residues, on the other hand, is exactly what Yagasaki is doing, as described in the Abstract,

> "In connection with compression-coding of video signals on the basis of inter-frame correlation, a single reference table is used for variable length encoding of inter-frame motion vectors established on the basis of various motion vector value ranges and degrees of accuracy. A reference table is provided for variable length encoding motion vectors based on a particular value range and degree of accuracy. In order to use the same table for motion vectors based on a larger value range than that for which the table was designed, the value of a motion vector to be encoded is divided to form a quotient and a remainder. An addition bit code is formed on the basis of the remainder and is appended to a variable length code which corresponds in the reference table to the quotient so that a

> variable length code value is formed for the motion vector based on the larger range."

Thus, Yagasaki is going to transmit the residues, he just seeks to code the residues efficiently, using variable length codes in which longer code words represent lower accuracy, i.e. larger residues. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would have been deterred, rather than encouraged, from the modification proposed in the final Office Action, since Lynch teaches away from encoding residues at all. Consequently, the Examiner has failed to set forth a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Appellants, therefore, respectfully request that the rejection of independent claim 13 be withdrawn.

Third, independent claim 13, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 13. Neither Lynch nor Yagasaki, for example, disclose "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 13.

The Examiner asserts at page 3, lines 18-23, continuing at page 4, lines 1 and 2,

"As previously stated, col. 11, ln. 18-22 and fig.17, note "MODE" is determined and motion vector calculator 111 determines the prediction accuracy based on non-uniformity of the plural motion vectors."

This is submitted to be incorrect. As shown in Fig. 17, only one lead, and hence one input, enters AO Mv Calculator 111. Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 13.

Furthermore, the Area Overlap (AO) method depicted in Fig. 17 is described in Lynch at column 11, lines 5-22 as deriving motion vectors for B frames from motion vectors for an anchor frame that is referenced to a previous anchor frame, in the singular. Each motion vector is derived from a single anchor frame, not "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 13. The motion vectors themselves are input singly to AO Mv Calculator 111, as is apparent from the single input lead. In particular, as described in Lynch at column 11, lines 5-22,

> "A decoder for the AO method is shown in FIG. 17 in which components corresponding to those of FIG. 13 are designated in the same way. In view of the fact that motion vectors for B frames can also be derived in accordance with this

> invention from motion vectors for an anchor frame that is referenced to a previous anchor frame, blocks 110 and 111 are used by the decoder for this purpose. These are identical to blocks 89 and 90 in FIG. 14. The mode information instructs the displacement blocks 104 and 105 as well as switch 107 as to the prediction mode to be used for B frame motion blocks. Otherwise, the operation of this decoder is identical to that of the decoder for the IS method."

Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 13.

Yagasaki, for its part, describes no motion vectors at all, let alone "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 13. Yagasaki, rather, is discussing encoding motion vectors at column 18, lines 1-13, not "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 13, contrary to the assertion in the final Office Action at page 3, lines 1-3. In particular, as described in Yagasaki at column 18, lines 1-13,

> "Finally, there will be described an embodiment of the present invention in which motion vector values are encoded with differential PCM (DPCM), so that the data transmitted with respect to motion vector values represents only the differences between motion vector values for adjacent blocks. An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0. The difference values are then variable length encoded in a motion vector VLC."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 13, independent claim 13 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 13 be withdrawn.

D. Independent Claim 20

First, independent claim 20 is patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 20. Neither Lynch nor Yagasaki, for example, disclose "a motion vector encoding device which

predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20.

The Examiner asserts at page 2, lines 12-16 of the final Office Action:

"Lynch discloses the predicting meant for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, as disclosed in fig.17 and col. 10, ln. 23, to col. 11, ln. 4, where the "PREDICTION" or the prediction of the motion vector is predicatively done."

This is submitted to be incorrect. Lynch, rather, extrapolates motion vectors for a particular B Block from that B block only, as described at column 10, lines 42, 43, and 44,

> "a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

The passage in Lynch cited in the final Office Action, to the contrary, mentions nothing about "a motion vector encoding device, which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20.

Fig. 17, for its part, shows a decoder for the AO method, not "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20. Lynch, in fact, describes deriving motion vectors for B frames from motion vectors for *an* anchor frame that is referenced to *a* previous anchor frame, in the description pertaining to Fig. 17 at column 11, lines 13-16,

> "motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame."

Thus, Lynch derives a motion vector for a B frame from a single anchor frame that is referenced to a previous anchor frame. This is to be contrasted with independent claim 20, which recites "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner asserts further at page 2, lines 16-19 of the final Office Action:

"that fig. 14 shows that the target block motion vector was predicted for accurately predicting the image data, especially in the MPEG interframe encoding/decoding environment when obtaining the motion vector between a current frame and a reference frame."

This is submitted to be incorrect. Lynch describes Fig. 14, rather, at column 10, lines 31-46 as showing interpolation of B frames *from* a predicted frame such as P_3, not "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20. In particular, as described in Lynch at column 10, lines 31-46,

> "FIG. 14 is a block diagram for an encoder incorporating this invention. Those components corresponding to components in FIG. 11 are designated in the same way. Forward motion vectors for P_3, such as mv_{30}, are stored in a memory 89 for a period (delay) of one or two frames as required by frames B_1 and B_2 respectively (see FIG. 3). The stored motion vectors are supplied by the Fmv Memory 89 to an Area Overlap Motion Vector Calculator 90 where forward and backward motion vectors AO FMv and AO BMv are calculated for B frame motion blocks in a manner described by reference to FIGS. 4 through 10. As previously explained, a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

Thus, in Lynch, whatever prediction went into P_3 happened before Fig. 14, and involved no "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20.

Finally, the Examiner asserts at page 2, lines 19-21 of the final Office Action that,

"Also, Lynch's fig. 5 discloses that a frame with the shaded area of interest has, for instance, four blocks that are obtained, utilized for predicting a motion vector."

This is submitted to be incorrect. Fig. 5, rather, depicts using the degree of overlap of a projected motion vector to estimate the accuracy of the projection. In particular, as described at column 4, lines 60-68, continuing at column 5, lines 14 of Lynch,

> "By way of example, suppose we wish to find the area of overlap of the projection of the motion block in the upper left corner of the P_3 frame of FIG. 4 with the motion block at j=1, i=2 of the B_1 frame. As shown in FIG. 5, L1=16 pixels and L2=8 pixels. By observation, the width of the overlap is 12 pixels and its height is 6, so that the desired area is 12 X 6=72 pixels. If the defined relationship is that the reference point is the top left corner of a block, then u=12 and v=18 and x=16 and y=16 so that the area of overlap in accordance with the formula is:
> AO = [16-|16-12|][8-|16-18|] = [16-4][8-2] = 12 X 6 = 72
> As illustrated by the flow charts of FIGS. 6 through 10 for calculating the areas of overlap AO, the areas of overlap in each of the blocks of a B frame are derived for each motion block in a P frame and the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap."

Thus, in Lynch, the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap. Therefore, the magnitude of the overlap is assessed *after* the projection. Any prediction to be performed in Fig. 5 has already occurred, and now the accuracy of a projection of is being assessed. None of the four blocks will be used to predict anything, let alone motion. This is to be contrasted with independent claim 20, which recites, "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner, in fact, acknowledges at page 2, line 23, continuing at page 3, line1 of the final Office Action that Lynch,

"does not disclose the prediction of a motion vector values of blocks adjacent to the target block of the same frame."

The Examiner seeks to compensate for this deficiency of Lynch by combining Lynch with Yagasaki. Yagasaki, however, neither teaches, discloses, nor suggests "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block" either, and thus cannot compensate for the deficiencies of Lynch with respect to independent claim 20.

The Examiner asserts at page 3, lines 1-3 of the final Office Action that,

"Yagasaki teaches the motion vectors of adjacent blocks to the target block in the same frame are implemented for obtaining a predicted motion vector, as disclosed at col. 18, ln. 1-13."

This is submitted to be incorrect. Yagasaki is talking about differential encoding for transmitting motion vectors at column 18, lines 1-13, not "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20. Whatever predictions are to be done in Yagasaki have already been done. All Yagasaki is doing now is encoding the results. In particular, as described at column 18, lines 6-12 of Yagasaki,

> "An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0."

Thus, the motion vector values have already been produced. The adjacent blocks to which Yagasaki refers are adjacent blocks of data to be transmitted, not "a plurality of blocks adjacent to the target block," as recited in independent claim 20. Yagasaki, rather, is preserving

bandwidth by transmitting only the changes to the motion vectors relative to those around them, not "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20.

In particular, the only prediction discussed in Yagasaki relates to interframe predictive coding with motion compensation, such as at column 1, lines 31-42, not "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 20,

> "Inter-frame predictive coding using correlation between frames is one known technique for highly efficient coding of a moving picture signal. In particular, inter-frame predictive coding with motion compensation is known, as in the MPEG document referred to above.
>
> "Motion compensated predictive coding uses correlation over time within the picture signal. A difference signal is formed for a present frame with respect to a past frame, after compensating for motion in the picture between the two frames."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 20, independent claim 20 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 20 be withdrawn.

Second, independent claim 20 is patentable over Lynch in view of Yagasaki because the Examiner has not made out a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Here, the Examiner has pointed to no evidence, either in the references or the general knowledge of the prior art, of a suggestion or motivation to combine the references in the proposed manner. The broad conclusory statement by the Examiner at page 7, lines 4-8 of the final Office Action that,

"it would have been obvious to one of ordinary skill to combine the teachings of Lynch and Yagasaki as a whole for accurately predicting motion vectors so as to efficiently produce clear, precise images for viewing and saving costs,"

in particular, is not "evidence" of a suggestion or motivation to combine the references as required for a finding of obviousness.

Lynch, rather, is complete in itself. There would thus have been no reason for persons of ordinary skill in the art at the time the invention was made to look to Yagasaki to make up for any deficiency of Lynch. Simply put, there would have been no need to look to Yagasaki to produce clear, precise images for viewing and saving costs any more efficiently than Lynch already had.

Furthermore, Lynch teaches away from the combination proposed by the Examiner at column 2, lines 39-54, when he describes differential pulse code modulation systems, for example, as requiring the transmission of a significant amount of residue in most cases,

> "In article 4, which is incorporated herein by reference, a differential pulse code modulation system is described that is like the IS system described above except for the fact that the motion vectors for the B frames are derived from motion vectors such as mv_{30} or mv_{63} of FIG. 2 that indicate the relative position of a block in an anchor frame that matches a block in the next anchor frame. The motion vector selected for a motion block in a B frame is the motion vector for a block in the later anchor frame that is in the same spatial position. If linear motion is assumed, a motion vector mv_{20} (i, j) would equal $2/3mv_{30}$ (i, j) and mv_{23} (i, j) would equal $-1/3mv_{30}$ (i, j). While this method has the advantage of not transmitting motion vectors for the B frames, the motion vectors that are used require the transmission of a significant amount of residue in most cases. "

Transmitting residues, on the other hand, is exactly what Yagasaki is doing, as described in the Abstract,

> "In connection with compression-coding of video signals on the basis of inter-frame correlation, a single reference table is used for variable length encoding of inter-frame motion vectors established on the basis of various motion vector value ranges and degrees of accuracy. A reference table is provided for variable length encoding motion vectors based on a particular value range and degree of accuracy. In order to use the same table for motion vectors based on a larger value range than that for which the table was designed, the value of a motion vector to be encoded is divided to form a quotient and a remainder. An addition bit code is formed on the basis of the remainder and is appended to a variable length code which corresponds in the reference table to the quotient so that a variable length code value is formed for the motion vector based on the larger range."

Thus, Yagasaki is going to transmit the residues, he just seeks to code the residues efficiently, using variable length codes in which longer code words represent lower accuracy, i.e. larger residues. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would have been deterred, rather than encouraged, from the modification proposed in the final Office Action, since Lynch teaches away from encoding residues at all.

Consequently, the Examiner has failed to set forth a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Appellants, therefore, respectfully request that the rejection of independent claim 20 be withdrawn.

Third, independent claim 20, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 20. Neither Lynch nor Yagasaki, for example, disclose "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 20.

The Examiner asserts at page 3, lines 18-23, continuing at page 4, lines 1 and 2,

"As previously stated, col. 11, ln. 18-22 and fig.17, note "MODE" is determined and motion vector calculator 111 determines the prediction accuracy based on non-uniformity of the plural motion vectors."

This is submitted to be incorrect. As shown in Fig. 17, only one lead, and hence one input, enters AO Mv Calculator 111. Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 20.

Furthermore, the Area Overlap (AO) method depicted in Fig. 17 is described in Lynch at column 11, lines 5-22 as deriving motion vectors for B frames from motion vectors for an anchor frame that is referenced to a previous anchor frame, in the singular. Each motion vector is derived from a single anchor frame, not "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 20. The motion vectors themselves are input singly to AO Mv Calculator 111, as is apparent from the single input lead. In particular, as described in Lynch at column 11, lines 5-22,

> "A decoder for the AO method is shown in FIG. 17 in which components corresponding to those of FIG. 13 are designated in the same way. In view of the fact that motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame, blocks 110 and 111 are used by the decoder for this purpose. These are identical to blocks 89 and 90 in FIG. 14. The mode information instructs the displacement blocks 104 and 105 as well as switch 107 as to the prediction mode to be used for B frame motion blocks. Otherwise, the operation of this decoder is identical to that of the decoder for the IS method."

Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 20.

Yagasaki, for its part, describes no motion vectors at all, let alone "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 20. Yagasaki, rather, is discussing encoding motion vectors at column 18, lines 1-13, not "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 20, contrary to the assertion in the final Office Action at page 3, lines 1-3. In particular, as described in Yagasaki at column 18, lines 1-13,

> "Finally, there will be described an embodiment of the present invention in which motion vector values are encoded with differential PCM (DPCM), so that the data transmitted with respect to motion vector values represents only the differences between motion vector values for adjacent blocks. An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0. The difference values are then variable length encoded in a motion vector VLC."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 20, independent claim 20 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 20 be withdrawn.

E. Independent claim 21

First, independent claim 21 is patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 21. Neither Lynch nor Yagasaki, for example, disclose "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21.

The Examiner asserts at page 2, lines 12-16 of the final Office Action:

"Lynch discloses the predicting meant for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, as disclosed in fig.17 and col. 10, ln. 23, to col. 11, ln. 4, where the "PREDICTION" or the prediction of the motion vector is predicatively done."

This is submitted to be incorrect. Lynch, rather, extrapolates motion vectors for a particular B Block from that B block only, as described at column 10, lines 42, 43, and 44,

> "a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

The passage in Lynch cited in the final Office Action, to the contrary, mentions nothing about "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21.

Fig. 17, for its part, shows a decoder for the AO method, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21. Lynch, in fact, describes deriving motion vectors for B frames from motion vectors for *an* anchor frame that is referenced to *a* previous anchor frame, in the description pertaining to Fig. 17 at column 11, lines 13-16,

> "motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame."

Thus, Lynch derives a motion vector for a B frame from a single anchor frame that is referenced to a previous anchor frame. This is to be contrasted with independent claim 21, which recites "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner asserts further at page 2, lines 16-19 of the final Office Action:

"that fig. 14 shows that the target block motion vector was predicted for accurately predicting the image data, especially in the MPEG interframe encoding/decoding environment when obtaining the motion vector between a current frame and a reference frame."

This is submitted to be incorrect. Lynch describes Fig. 14, rather, at column 10, lines 31-46 as showing interpolation of B frames *from* a predicted frame such as P_3, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the

target block," as recited in independent claim 21. In particular, as described in Lynch at column 10, lines 31-46,

> "FIG. 14 is a block diagram for an encoder incorporating this invention. Those components corresponding to components in FIG. 11 are designated in the same way. Forward motion vectors for P_3, such as mv_{30}, are stored in a memory 89 for a period (delay) of one or two frames as required by frames B_1 and B_2 respectively (see FIG. 3). The stored motion vectors are supplied by the Fmv Memory 89 to an Area Overlap Motion Vector Calculator 90 where forward and backward motion vectors AO FMv and AO BMv are calculated for B frame motion blocks in a manner described by reference to FIGS. 4 through 10. As previously explained, a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

Thus, in Lynch, whatever prediction went into P_3 happened before Fig. 14, and involved no "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21.

Finally, the Examiner asserts at page 2, lines 19-21 of the final Office Action that,

"Also, Lynch's fig. 5 discloses that a frame with the shaded area of interest has, for instance, four blocks that are obtained, utilized for predicting a motion vector."

This is submitted to be incorrect. Fig. 5, rather, depicts using the degree of overlap of a projected motion vector to estimate the accuracy of the projection. In particular, as described at column 4, lines 60-68, continuing at column 5, lines 14 of Lynch,

> "By way of example, suppose we wish to find the area of overlap of the projection of the motion block in the upper left corner of the P_3 frame of FIG. 4 with the motion block at j=1, i=2 of the B_1 frame. As shown in FIG. 5, L1=16 pixels and L2=8 pixels. By observation, the width of the overlap is 12 pixels and its height is 6, so that the desired area is 12 X 6=72 pixels. If the defined relationship is that the reference point is the top left corner of a block, then u=12 and v=18 and x=16 and y=16 so that the area of overlap in accordance with the formula is:
> AO = [16-|16-12|][8-|16-18|] = [16-4][8-2] = 12 X 6 = 72
> As illustrated by the flow charts of FIGS. 6 through 10 for calculating the areas of overlap AO, the areas of overlap in each of the blocks of a B frame are derived for each motion block in a P frame and the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap."

Thus, in Lynch, the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap. Therefore, the magnitude of the overlap is assessed *after* the projection. Any prediction to be performed in Fig. 5 has already occurred, and now the accuracy of a projection of is being assessed. None of the four blocks

will be used to predict anything, let alone motion. This is to be contrasted with independent claim 21, which recites, "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner, in fact, acknowledges at page 2, line 23, continuing at page 3, line1 of the final Office Action that Lynch,

"does not disclose the prediction of a motion vector values of blocks adjacent to the target block of the same frame."

The Examiner seeks to compensate for this deficiency of Lynch by combining Lynch with Yagasaki. Yagasaki, however, neither teaches, discloses, nor suggests "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block" either, and thus cannot compensate for the deficiencies of Lynch with respect to independent claim 21.

The Examiner asserts at page 3, lines 1-3 of the final Office Action that,

"Yagasaki teaches the motion vectors of adjacent blocks to the target block in the same frame are implemented for obtaining a predicted motion vector, as disclosed at col. 18, ln. 1-13."

This is submitted to be incorrect. Yagasaki is talking about differential encoding for transmitting motion vectors at column 18, lines 1-13, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21. Whatever predictions are to be done in Yagasaki have already been done. All Yagasaki is doing now is encoding the results. In particular, as described at column 18, lines 6-12 of Yagasaki,

> "An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0."

Thus, the motion vector values have already been produced. The adjacent blocks to which Yagasaki refers are adjacent blocks of data to be transmitted, not "a plurality of blocks adjacent to the target block," as recited in independent claim 21. Yagasaki, rather, is preserving bandwidth by transmitting only the changes to the motion vectors relative to those around them, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21.

In particular, the only prediction discussed in Yagasaki relates to interframe predictive coding with motion compensation, such as at column 1, lines 31-42, not "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 21,

> "Inter-frame predictive coding using correlation between frames is one known technique for highly efficient coding of a moving picture signal. In particular, inter-frame predictive coding with motion compensation is known, as in the MPEG document referred to above.
>
> "Motion compensated predictive coding uses correlation over time within the picture signal. A difference signal is formed for a present frame with respect to a past frame, after compensating for motion in the picture between the two frames."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 21, independent claim 21 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 21 be withdrawn.

Second, independent claim 21 is patentable over Lynch in view of Yagasaki because the Examiner has not made out a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Here, the Examiner has pointed to no evidence, either in the references or the general knowledge of the prior art, of a suggestion or motivation to combine the references in the proposed manner. The broad conclusory statement by the Examiner at page 7, lines 4-8 of the final Office Action that,

> "it would have been obvious to one of ordinary skill to combine the teachings of Lynch and Yagasaki as a whole for accurately predicting motion vectors so as to efficiently produce clear, precise images for viewing and saving costs,"

in particular, is not "evidence" of a suggestion or motivation to combine the references as required for a finding of obviousness.

Lynch, rather, is complete in itself. There would thus have been no reason for persons of ordinary skill in the art at the time the invention was made to look to Yagasaki to make up for any deficiency of Lynch. Simply put, there would have been no need to look to Yagasaki to produce clear, precise images for viewing and saving costs any more efficiently than Lynch already had.

Furthermore, Lynch teaches away from the combination proposed by the Examiner at column 2, lines 39-54, when he describes differential pulse code modulation systems, for example, as requiring the transmission of a significant amount of residue in most cases,

> "In article 4, which is incorporated herein by reference, a differential pulse code modulation system is described that is like the IS system described above except for the fact that the motion vectors for the B frames are derived from motion vectors such as mv_{30} or mv_{63} of FIG. 2 that indicate the relative position of a block in an anchor frame that matches a block in the next anchor frame. The motion vector selected for a motion block in a B frame is the motion vector for a block in the later anchor frame that is in the same spatial position. If linear motion is assumed, a motion vector mv_{20} (i, j) would equal $2/3mv_{30}$ (i, j) and mv_{23} (i, j) would equal $-1/3mv_{30}$ (i, j). While this method has the advantage of not transmitting motion vectors for the B frames, the motion vectors that are used require the transmission of a significant amount of residue in most cases. "

Transmitting residues, on the other hand, is exactly what Yagasaki is doing, as described in the Abstract,

> "In connection with compression-coding of video signals on the basis of inter-frame correlation, a single reference table is used for variable length encoding of inter-frame motion vectors established on the basis of various motion vector value ranges and degrees of accuracy. A reference table is provided for variable length encoding motion vectors based on a particular value range and degree of accuracy. In order to use the same table for motion vectors based on a larger value range than that for which the table was designed, the value of a motion vector to be encoded is divided to form a quotient and a remainder. An addition bit code is formed on the basis of the remainder and is appended to a variable length code which corresponds in the reference table to the quotient so that a variable length code value is formed for the motion vector based on the larger range."

Thus, Yagasaki is going to transmit the residues, he just seeks to code the residues efficiently, using variable length codes in which longer code words represent lower accuracy, i.e. larger residues. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would have been deterred, rather than encouraged, from the modification proposed in the final Office Action, since Lynch teaches away from encoding residues at all. Consequently, the Examiner has failed to set forth a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Appellants, therefore, respectfully request that the rejection of independent claim 21 be withdrawn.

Third, independent claim 21, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 21. Neither Lynch nor Yagasaki, for example, disclose

"determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 21.

The Examiner asserts at page 3, lines 18-23, continuing at page 4, lines 1 and 2,

"As previously stated, col. 11, ln. 18-22 and fig.17, note "MODE" is determined and motion vector calculator 111 determines the prediction accuracy based on non-uniformity of the plural motion vectors."

This is submitted to be incorrect. As shown in Fig. 17, only one lead, and hence one input, enters AO Mv Calculator 111. Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 21.

Furthermore, the Area Overlap (AO) method depicted in Fig. 17 is described in Lynch at column 11, lines 5-22 as deriving motion vectors for B frames from motion vectors for an anchor frame that is referenced to a previous anchor frame, in the singular. Each motion vector is derived from a single anchor frame, not "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 21. The motion vectors themselves are input singly to AO Mv Calculator 111, as is apparent from the single input lead. In particular, as described in Lynch at column 11, lines 5-22,

> "A decoder for the AO method is shown in FIG. 17 in which components corresponding to those of FIG. 13 are designated in the same way. In view of the fact that motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame, blocks 110 and 111 are used by the decoder for this purpose. These are identical to blocks 89 and 90 in FIG. 14. The mode information instructs the displacement blocks 104 and 105 as well as switch 107 as to the prediction mode to be used for B frame motion blocks. Otherwise, the operation of this decoder is identical to that of the decoder for the IS method."

Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 21.

Yagasaki, for its part, describes no motion vectors at all, let alone "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 21. Yagasaki, rather, is discussing encoding motion vectors at column 18, lines 1-13, not "determining accuracy of a prediction

made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 21, contrary to the assertion in the final Office Action at page 3, lines 1-3. In particular, as described in Yagasaki at column 18, lines 1-13,

> "Finally, there will be described an embodiment of the present invention in which motion vector values are encoded with differential PCM (DPCM), so that the data transmitted with respect to motion vector values represents only the differences between motion vector values for adjacent blocks. An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0. The difference values are then variable length encoded in a motion vector VLC."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 21, independent claim 21 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 21 be withdrawn.

F. <u>Independent Claim 22</u>

<u>First</u>, independent claim 22, and the claim dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 22. Neither Lynch nor Yagasaki, for example, disclose "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22.

The Examiner asserts at page 2, lines 12-16 of the final Office Action:

"Lynch discloses the predicting meant for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, as disclosed in fig.17 and col. 10, ln. 23, to col. 11, ln. 4, where the "PREDICTION" or the prediction of the motion vector is predicatively done."

This is submitted to be incorrect. Lynch, rather, extrapolates motion vectors for a particular B Block from that B block only, as described at column 10, lines 42, 43, and 44,

> "a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

The passage in Lynch cited in the final Office Action, to the contrary, mentions nothing about "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22.

Fig. 17, for its part, shows a decoder for the AO method, not "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22. Lynch, in fact, describes deriving motion vectors for B frames from motion vectors for *an* anchor frame that is referenced to *a* previous anchor frame, in the description pertaining to Fig. 17 at column 11, lines 13-16,

> "motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame."

Thus, Lynch derives a motion vector for a B frame from a single anchor frame that is referenced to a previous anchor frame. This is to be contrasted with independent claim 22, which recites "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner asserts further at page 2, lines 16-19 of the final Office Action:

"that fig. 14 shows that the target block motion vector was predicted for accurately predicting the image data, especially in the MPEG interframe encoding/decoding environment when obtaining the motion vector between a current frame and a reference frame."

This is submitted to be incorrect. Lynch describes Fig. 14, rather, at column 10, lines 31-46 as showing interpolation of B frames *from* a predicted frame such as P_3, not "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22. In particular, as described in Lynch at column 10, lines 31-46,

> "FIG. 14 is a block diagram for an encoder incorporating this invention. Those components corresponding to components in FIG. 11 are designated in the same way. Forward motion vectors for P_3, such as mv_{30}, are stored in a memory 89 for a period (delay) of one or two frames as required by frames B_1 and B_2 respectively (see FIG. 3). The stored motion vectors are supplied by the Fmv Memory 89 to an Area Overlap Motion Vector Calculator 90 where forward and backward motion vectors AO FMv and AO BMv are calculated for B frame motion blocks in a manner described by reference to FIGS. 4 through 10. As previously explained, a backward motion vector for a B_1 block=-2/3 of motion vector mv_{30}, and the

forward motion vector is 1/3 mv_{30}. These motion vectors are supplied to the motion compensator 68 via a lead M'."

Thus, in Lynch, whatever prediction went into P_3 happened before Fig. 14, and involved no "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22.

Finally, the Examiner asserts at page 2, lines 19-21 of the final Office Action that,

"Also, Lynch's fig. 5 discloses that a frame with the shaded area of interest has, for instance, four blocks that are obtained, utilized for predicting a motion vector."

This is submitted to be incorrect. Fig. 5, rather, depicts using the degree of overlap of a projected motion vector to estimate the accuracy of the projection. In particular, as described at column 4, lines 60-68, continuing at column 5, lines 14 of Lynch,

"By way of example, suppose we wish to find the area of overlap of the projection of the motion block in the upper left corner of the P_3 frame of FIG. 4 with the motion block at j=1, i=2 of the B_1 frame. As shown in FIG. 5, L1=16 pixels and L2=8 pixels. By observation, the width of the overlap is 12 pixels and its height is 6, so that the desired area is 12 X 6=72 pixels. If the defined relationship is that the reference point is the top left corner of a block, then u=12 and v=18 and x=16 and y=16 so that the area of overlap in accordance with the formula is:
AO = [16-|16-12|][8-|16-18|] = [16-4][8-2] = 12 X 6 = 72
As illustrated by the flow charts of FIGS. 6 through 10 for calculating the areas of overlap AO, the areas of overlap in each of the blocks of a B frame are derived for each motion block in a P frame and the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap."

Thus, in Lynch, the vector for the block in the B frame is derived from the vector of the motion block in the P frame whose projection has the most overlap. Therefore, the magnitude of the overlap is assessed *after* the projection. Any prediction to be performed in Fig. 5 has already occurred, and now the accuracy of a projection of is being assessed. None of the four blocks will be used to predict anything, let alone motion. This is to be contrasted with independent claim 22, which recites, "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block."

The Examiner, in fact, acknowledges at page 2, line 23, continuing at page 3, line1 of the final Office Action that Lynch,

"does not disclose the prediction of a motion vector values of blocks adjacent to the target block of the same frame."

The Examiner seeks to compensate for this deficiency of Lynch by combining Lynch with Yagasaki. Yagasaki, however, neither teaches, discloses, nor suggests "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block " either, and thus cannot compensate for the deficiencies of Lynch with respect to independent claim 22.

The Examiner asserts at page 3, lines 1-3 of the final Office Action that,

"Yagasaki teaches the motion vectors of adjacent blocks to the target block in the same frame are implemented for obtaining a predicted motion vector, as disclosed at col. 18, ln. 1-13."

This is submitted to be incorrect. Yagasaki is talking about differential encoding for transmitting motion vectors at column 18, lines 1-13, not "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22. Whatever predictions are to be done in Yagasaki have already been done. All Yagasaki is doing now is encoding the results. In particular, as described at column 18, lines 6-12 of Yagasaki,

> "An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0."

Thus, the motion vector values have already been produced. The adjacent blocks to which Yagasaki refers are adjacent blocks of data to be transmitted, not "a plurality of blocks adjacent to the target block," as recited in independent claim 22. Yagasaki, rather, is preserving bandwidth by transmitting only the changes to the motion vectors relative to those around them, not "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22.

In particular, the only prediction discussed in Yagasaki relates to interframe predictive coding with motion compensation, such as at column 1, lines 31-42, not "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," as recited in independent claim 22,

> "Inter-frame predictive coding using correlation between frames is one known technique for highly efficient coding of a moving picture signal. In particular, inter-frame predictive coding with motion compensation is known, as in the MPEG document referred to above.

"Motion compensated predictive coding uses correlation over time within the picture signal. A difference signal is formed for a present frame with respect to a past frame, after compensating for motion in the picture between the two frames."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 22, independent claim 22 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 22 be withdrawn.

Second, independent claim 22, and the claim dependent thereon, are patentable over Lynch in view of Yagasaki because the Examiner has not made out a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Here, the Examiner has pointed to no evidence, either in the references or the general knowledge of the prior art, of a suggestion or motivation to combine the references in the proposed manner. The broad conclusory statement by the Examiner at page 7, lines 4-8 of the final Office Action that,

"it would have been obvious to one of ordinary skill to combine the teachings of Lynch and Yagasaki as a whole for accurately predicting motion vectors so as to efficiently produce clear, precise images for viewing and saving costs,"

in particular, is not "evidence" of a suggestion or motivation to combine the references as required for a finding of obviousness.

Lynch, rather, is complete in itself. There would thus have been no reason for persons of ordinary skill in the art at the time the invention was made to look to Yagasaki to make up for any deficiency of Lynch. Simply put, there would have been no need to look to Yagasaki to produce clear, precise images for viewing and saving costs any more efficiently than Lynch already had.

Furthermore, Lynch teaches away from the combination proposed by the Examiner at column 2, lines 39-54, when he describes differential pulse code modulation systems, for example, as requiring the transmission of a significant amount of residue in most cases,

"In article 4, which is incorporated herein by reference, a differential pulse code modulation system is described that is like the IS system described above except for the fact that the motion vectors for the B frames are derived from motion vectors such as mv_{30} or mv_{63} of FIG. 2 that indicate the relative position of a block in an anchor frame that matches a block in the next anchor frame. The motion

vector selected for a motion block in a B frame is the motion vector for a block in the later anchor frame that is in the same spatial position. If linear motion is assumed, a motion vector mv_{20} (i, j) would equal $2/3mv_{30}$ (i, j) and mv_{23} (i, j) would equal $-1/3mv_{30}$ (i, j). While this method has the advantage of not transmitting motion vectors for the B frames, the motion vectors that are used require the transmission of a significant amount of residue in most cases. "

Transmitting residues, on the other hand, is exactly what Yagasaki is doing, as described in the Abstract,

"In connection with compression-coding of video signals on the basis of inter-frame correlation, a single reference table is used for variable length encoding of inter-frame motion vectors established on the basis of various motion vector value ranges and degrees of accuracy. A reference table is provided for variable length encoding motion vectors based on a particular value range and degree of accuracy. In order to use the same table for motion vectors based on a larger value range than that for which the table was designed, the value of a motion vector to be encoded is divided to form a quotient and a remainder. An addition bit code is formed on the basis of the remainder and is appended to a variable length code which corresponds in the reference table to the quotient so that a variable length code value is formed for the motion vector based on the larger range."

Thus, Yagasaki is going to transmit the residues, he just seeks to code the residues efficiently, using variable length codes in which longer code words represent lower accuracy, i.e. larger residues. It is submitted, therefore, that persons of ordinary skill in the art at the time the invention was made would have been deterred, rather than encouraged, from the modification proposed in the final Office Action, since Lynch teaches away from encoding residues at all. Consequently, the Examiner has failed to set forth a prima facie case of obviousness with respect to the combination of Lynch in view of Yagasaki proposed by the Examiner. Appellants, therefore, respectfully request that the rejection of independent claim 22 be withdrawn.

Third, independent claim 22, and the claims dependent thereon, are patentable over Lynch in view of Yagasaki because neither Lynch and Yagasaki, or their combination, disclose all of the features of independent claim 22. Neither Lynch nor Yagasaki, for example, disclose "determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold," as recited in independent claim 22.

The Examiner asserts at page 3, lines 18-23, continuing at page 4, lines 1 and 2,

"As previously stated, col. 11, ln. 18-22 and fig.17, note "MODE" is determined and motion vector calculator 111 determines the prediction accuracy based on non-uniformity of the plural motion vectors."

This is submitted to be incorrect. As shown in Fig. 17, only one lead, and hence one input, enters AO Mv Calculator 111. Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors," as recited in independent claim 22.

Furthermore, the Area Overlap (AO) method depicted in Fig. 17 is described in Lynch at column 11, lines 5-22 as deriving motion vectors for B frames from motion vectors for an anchor frame that is referenced to a previous anchor frame, in the singular. Each motion vector is derived from a single anchor frame, not "determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold," as recited in independent claim 22. The motion vectors themselves are input singly to AO Mv Calculator 111, as is apparent from the single input lead. In particular, as described in Lynch at column 11, lines 5-22,

> "A decoder for the AO method is shown in FIG. 17 in which components corresponding to those of FIG. 13 are designated in the same way. In view of the fact that motion vectors for B frames can also be derived in accordance with this invention from motion vectors for an anchor frame that is referenced to a previous anchor frame, blocks 110 and 111 are used by the decoder for this purpose. These are identical to blocks 89 and 90 in FIG. 14. The mode information instructs the displacement blocks 104 and 105 as well as switch 107 as to the prediction mode to be used for B frame motion blocks. Otherwise, the operation of this decoder is identical to that of the decoder for the IS method."

Thus, AO Mv Calculator 111 uses but one motion vector at a time, rather than "determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold," as recited in independent claim 22.

Yagasaki, for its part, describes no motion vectors at all, let alone "determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold," as recited in independent claim 22. Yagasaki, rather, is discussing encoding motion vectors at column 18, lines 1-13, not "determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold," as recited in

independent claim 22, contrary to the assertion in the final Office Action at page 3, lines 1-3. In particular, as described in Yagasaki at column 18, lines 1-13,

> "Finally, there will be described an embodiment of the present invention in which motion vector values are encoded with differential PCM (DPCM), so that the data transmitted with respect to motion vector values represents only the differences between motion vector values for adjacent blocks. An encoder according to this embodiment takes advantage of the strong spatial correlation of the motion vector values and forms difference values representing differences between motion vectors in adjacent blocks so that the resulting difference values are concentrated around 0. The difference values are then variable length encoded in a motion vector VLC."

Since neither Lynch nor Yagasaki teach, disclose, or suggest "determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold," their combination cannot either. Thus, even if Lynch and Yagasaki were combined as proposed by the Examiner, the claimed invention would not result. Accordingly, because neither Lynch nor Yagasaki, nor their combination, disclose all of the features of independent claim 22, independent claim 22 is patentable over Lynch in view of Yagasaki. Appellants, therefore, respectfully request that the rejection of independent claim 22 be withdrawn.

For the forgoing reasons, Appellants respectfully request that the Board reverse the outstanding rejections of the claims of this application.

CONTINGENT AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT AND CONTINGENT PETITION FOR EXTENSION OF TIME

Unless a check for the present Brief on Appeal is submitted herewith for the fee required under 37 C.F.R. § 41.20(b)(2), please charge said fee to Deposit Account No. 19-3935.

Appellants hereby petition for any extension of time that may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 19-3935.

If any further fees, other than and except for the issue fee, are necessary with respect to this paper, the U.S.P.T.O. is requested to obtain the same from deposit account number 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

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VIII. CLAIMS APPENDIX

11. (previously presented) A motion vector decoding device for decoding an encoding result which is obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, comprising:

predicting means for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block;

determining means for determining accuracy of a prediction made by said predicting means based on degrees of non-uniformity of the plurality of motion vectors; and

decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means.

12. (previously presented) A motion vector decoding device for decoding an output of a motion vector encoding device which predicts a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block within the frame, determines accuracy of a prediction based on degrees of non-uniformity of a plurality of motion vectors which have already been encoded in an area adjacent to the target block, and encodes the motion vector of the target block by using a result of the prediction with an encoding method determined based on a result of a determination of the accuracy of the prediction, in order to encode motion vectors of respective blocks obtained by partitioning each frame of moving image data, comprising:

predicting means for predicting the motion vector of the target block within the frame based on the plurality of motion vectors of the at least two of the plurality of blocks adjacent to the target block used to make the determination within the motion vector encoding device;

determining means for determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold; and

decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means.

13. (previously presented) A motion vector decoding method for decoding a result of encoding obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, comprising the steps of:

predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block;

determining accuracy of a prediction based on degrees of non-uniformity of the plurality of motion vectors; and

decoding the motion vector of the target block by using a result of the prediction with a decoding method determined based on a result of a determination of the accuracy of the prediction.

14. (previously presented) The motion vector decoding device according to claim 11, wherein said determining means determines the accuracy of the prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors which have already been decoded in an area adjacent to the target block.

15. (previously presented) The motion vector decoding device according to claim 12, wherein said determining means determines the accuracy of the prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors which have already been decoded in an area adjacent to the target block.

16. (previously presented) The motion vector decoding device according to claim 13, wherein said determining means determines the accuracy of the prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors which have already been decoded in an area adjacent to the target block.

17. (previously presented) The motion vector decoding device according to claim 11, wherein said encoding means comprises:

a plurality of individual decoding means for decoding the motion vector of the target block with unique decoding methods; and

selecting means for selecting one of said plurality of individual decoding means based on the result of the determination made by said determining means, and for outputting a result of decoding performed by the selected individual decoding means.

18. (previously presented) The motion vector decoding device according to claim 12, wherein said encoding means comprises:

a plurality of individual decoding means for decoding the motion vector of the target block with unique decoding methods; and

selecting means for selecting one of said plurality of individual decoding means based on the result of the determination made by said determining means, and for outputting a result of decoding performed by the selected individual decoding means.

19. (previously presented) The motion vector decoding device according to claim 13, wherein said encoding means comprises:

a plurality of individual decoding means for decoding the motion vector of the target block with unique decoding methods; and

selecting means for selecting one of said plurality of individual decoding means based on the result of the determination made by said determining means, and for outputting a result of decoding performed by the selected individual decoding means.

20. (previously presented) A motion vector decoding device for decoding an output of a motion vector encoding device which predicts a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block, determines accuracy of a prediction based on a plurality of motion vectors which have already been encoded in an area adjacent to the target block, and encodes the motion vector of the target block by using a result of the prediction with an encoding method determined based on a result of a determination of the accuracy of the prediction, in order to encode motion vectors of respective blocks obtained by partitioning each frame of moving image data, comprising:

predicting means for predicting the motion vector of the target block based on the plurality of motion vectors used to make the determination within the motion vector encoding device;

determining means for determining accuracy of a prediction made by said predicting means based on the degrees of non-uniformity of the plurality of motion vectors; and

decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means.

21. (previously presented) A motion vector decoding device for decoding an encoding result which is obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, comprising:

predicting means for predicting a motion vector of a target block based on motion vectors of a plurality of blocks adjacent to the target block;

determining means for determining accuracy of a prediction made by said predicting means based on the plurality of motion vectors; and

decoding means for decoding the motion vector of the target block by using a result of the prediction made by said predicting means with a decoding method determined based on a result of a determination made by said determining means.

22. (previously presented) A motion vector decoding method for decoding a result of encoding obtained by encoding motion vectors of respective blocks obtained by partitioning each frame of moving image data, comprising:

predicting a motion vector of a target block within a frame based on motion vectors of a plurality of blocks adjacent to the target block within the frame;

determining accuracy of a prediction based on the plurality of motion vectors by determining whether differences between any of the vectors is greater than a threshold; and

decoding the motion vector of the target block by using a result of the prediction with a decoding method determined based on a result of a determination of the accuracy of the prediction.

23. (previously presented) A method as recited in claim 22, wherein the motion vectors comprise first, second and third motion vectors said determining comprises:

determining a first absolute value of difference between the first and second motion vectors, determining a second absolute value of difference between the second and third motion vectors, and determining a third absolute value of difference between the first and third motion vectors;

comparing the first absolute value to the threshold, comparing the second absolute value to the threshold and comparing the third absolute value to the threshold; and

indicating that the prediction is not accurate when any of the first, second and third absolute values are greater than the threshold.

IX. EVIDENCE APPENDIX

Not applicable.

X. RELATED PROCEEDINGS APPENDIX

Not applicable.